Does human exposure alter vocalisation rate in Little Penguin *Eudyptula minor*?

C Scarpaci

College of Engineering and Science, Werribee Campus, Victoria University, PO Box 14428, MCMC, Victoria 8001

Abstract
The rate of vocalisations in Little Penguin *Eudyptula minor* was documented to determine whether human presence (handling of penguins), gender and weight influenced vocal production. Observations were conducted during volunteer research nights and a total of 50 penguins were studied at the St Kilda penguin colony. Focal individual penguins were observed for vocal rate continuously within 1 minute focal scans. Rates of vocalisations were documented as rate of vocalisation per penguin and correlated with capture experience, gender and weight. Rates of vocalisation were significantly influenced by capture experience and handling time and suggest vocalisations may be used as a gauge to assess impact (e.g. human presence) across time in avian tourism settings. Levels of tolerance (reducing or ceasing to respond to the stimulus) may be indicative of habituation and such data could be valuable for the management of avian tourism. (*The Victorian Naturalist* **131**(5), 2014, 160-162)

Keywords: penguins, tourism, vocalisation, behaviour

Introduction

Nature-based tourism has experienced exponential growth and seabird tourism is a popular activity (Knight and Gutzwiller 1995). Minimal research is available on the impact that tourism may pose on Little Penguins *Eudyptula minor* found in southern Australia, New Zealand and Chatham Islands. Tourism impact studies assess the behavioural and physiological reactions to stimuli, such as tourism; management protocols that protect wildlife and industry are drawn from the results. Therefore, effective tourism management requires scientists to isolate factors (e.g. reduction in foraging effort) that signal disturbance. This study documents whether the rate of vocalisations that are a signal of disturbance in Little Penguins is dependent on exposure to human handling, gender and weight. The study colony is a resident urban colony of *Eudyptula minor* in St Kilda, Victoria, Australia, which has been exposed to long-term human presence (at least 25 years) due to an active long-term community initiative research group. The study colony provided the opportunity to detect whether behavioural responses to people are influenced by exposure.

Methods

Data on penguin vocalisation was collected from the St Kilda colony from May to September 2004. The St Kilda penguin population was selected based on the available long-term data, ability to collect data simultaneously with Earthcare volunteers and ease of access to the study site. This allowed the researcher to observe vocal behaviour of penguins whilst Earthcare volunteers conducted their research. Earthcare volunteers captured and released penguins after searching randomly for them at various locations on the breakwater. Penguins caught were taken by volunteers to a mobile workstation on the breakwater. The penguins were sexed, weighed and identified via historical tags. Individual penguins that lacked a tag were micro-chipped by a qualified veterinary specialist; for the purpose of this study, penguins were categorised as 'first capture' or 'previously captured'.

The period of time a penguin was handled was measured from the moment the penguin was delivered to the work station until the time it was returned to the site of capture. Data could not be collected from the time of capture due to the numerous volunteers searching for penguins at various locations on the breakwater. The weight of the penguins was divided into four categories—700–1100 g, 1101–1300 g, 1301–1500 g and 1501+ g.

Individual focal animal vocalisations were recorded from the moment a volunteer handled the penguin for data collection of gender, weight and identification at the workstation. The num-

ber of vocalisations produced by each penguin was recorded using continuous observations across a one minute focal scan (Altmann 1974) and recorded onto digital audio tape using a recording microphone. At the onset of the penguin emitting a vocalisation, movement in the beak could be observed. Vocalisations per focal individual was correlated with gender, weight and capture experience. The duration of handling was recorded for each penguin.

A one way analysis of variance (ANOVA) was conducted in accordance with Zar (1999) and significance was determined at $p< 0.05$.

Results

Fifty focal individual penguins (29 females, 21 males) were studied. The majority weighed 1101–1300 g (n = 24) followed by 700–1100 (n = 21), 1301–1500 (n = 3) and 1501+ (n = 2). The maximum number of penguins captured and released per Earthcare volunteer night session was 12 (Mean = 6.25, Range = 0–12, n = 8). The mean time of handling per focal penguin was 149.5 seconds (S.D. = 58.6, Range = 73–333, n = 50). The mean number of vocalisations produced per male penguin per minute was 5.4 (Range = 0–23.7, S.E. = 1.5, n = 21) and for females 3.5 (Range = 0–20.3, S.E. = 0.8, n = 29) with no significant difference ($P = 0.23$) across gender. The mean number of vocalisations produced by weight category was highest in the 1100-1300 g weight but this was not significant across weight categories ($p = 0.305$). The mean number of vocalisations produced per minute was significantly influenced by capture experience and handling time. The mean number of vocalisations produced during the first minute of capture per penguin for first capture was 10.2 (Range= 0–39; S.E. = 3.5, n = 10) and 4.2 (Range = 0–26; S.E. = 0.83, n = 40) for penguins with capture experience ($F = 6.3$, $df = 1$, $P = 0.015$). At the second minute first capture vocal rate was 7.4 (Range = 0-18; S.E. = 2.0, n = 10) and 3.4 (Range = 0–20; S.E. = 0.8, n = 40) for penguins with capture experience ($F = 4.3$, $df = 1$, $P = 0.042$). Rates of vocalisations were found not to be significantly different across capture experience in the third minute ($P = 0.82$).

Discussion

Preliminary findings indicate that rates of vocalisations of Little Penguins across the first two minutes of capture are influenced by capture experience. The higher vocalisation rate in first capture penguins could suggest that capture is perceived as a threat. The response to vocalise may function to: a) startle the perceived threat (human handler); b) attract colony members to the vicinity of the threat to create a chaotic environment that could allow for escape from capture; c) warn kin members of the presence and location of a threat; and d) act as a distress call for support. The lower rate of vocalisations post two minutes may be attributed to: a) lessened threat; b) opportunity for kin members to respond to threat; and c) to conserve energy. Experienced penguins may have learnt through previous captures that human capture is more of a disturbance than a threat, and vocalise to inform kin members of either their locality or presence of handler; but this occurs to a lesser extent than with first capture penguins. This also could indicate that the previously captured portion of the St Kilda penguin colony has become tolerant (a form of habituation) to the presence of people.

Rate of vocal increase in response to a stressor previously has been documented in avian species, e.g. where rates of vocalisations of Mexican Owls increased markedly in the presence of hikers (Swarthout and Steidl 2003) and when simulated recreationists camped within 100 m of breeding eagles (Steidl and Anthony 2000). In another research study, Fowler (1999) demonstrated that exposure to humans influenced the behavioural and hormonal response of Magellanic Penguins in Argentina. Mean number of vocalisations per nest were lower at the tourism site in contrast to an isolated site where the human presence was minimal to none. This indicates that exposure to people could influence behavioural responses, e.g. rates of vocalisations as demonstrated in this study. Minimal research is available on the impact that tourism (or the presence of people) may pose on Little Penguins; however, avian tourism is on the increase. Within the literature available for Little Penguins it is noted that tourism has a detrimental impact through fatalities to eggs and chicks during the breeding season at Middle Island, Victoria (Overeem and Wallis 2003). Little Penguins also have been observed to show intrinsic tolerance to vessel

approach, vibration and engine noise (Higham and Shelton 2011). This study indicates that rate of vocalisation may provide a gauge to assess levels of disturbance to penguins at tourism sites. Tolerance is defined as 'intensity of disturbance that an individual ... tolerates without responding in a defined way' that is demonstrated through empirical observations at a given time across numerous individuals (Bejder *et al.* 2009). The significantly reduced rate of vocalisations by experienced penguins could represent a level of tolerance. Further research should be carried out to assess the applicability of vocalisations in avian species to assess human impact at nesting sites which are exposed to tourism.

Acknowledgement
I am grateful to Earthcare organisers and volunteers for allowing me the opportunity to observe the penguins whilst conducting their research nights.

References

Altmann J (1974) Observational study of behaviour: sampling methods. *Behavior* **49**, 227–267.
Bejder L, Samuels A, Whitehead H, Finn H and Allen S (2009) Impact assessment research: use and misuse of habituation, sensitisation and tolerance in describing wildlife responses to anthropogenic stimuli. *Marine Ecology Progress Series* **39**, 177–185.
Fowler GES (1999) Behavioral and hormonal responses of Magellanic penguins (*Spheniscus magellanicus*) to tourism and nest site visitation. *Biological Conservation* **90**, 143–149.
Higham JES and Shelton EJ (2011) Tourism and wildlife habituation: Reduced population fitness or cessation of impact? *Tourism Management* **32**, 1290–1298.
Knight RL and Gutzwiller KW (1995) *Wildlife and recreationists: coexistence through management and research.* (Island Press: Washington DC)
Overeem RL and Wallis RL (2003) Little penguin *Eudyptula minor* at Middle Island, Western Victoria: current status. *The Victorian Naturalist* **120**, 76–83.
Steidl RG and Anthony RG (2000) Experimental effects of human activity on breeding bald eagles. *Ecological Applications* **10**, 258–268.
Swarthout ECH and Steidl RG (2003) Experimental effects of hiking on breeding Mexican owls. *Conservation Biology* **17**, 307–315.
Zar JH (1999) Biostatistical Analysis. (Prentice-Hall Inc: Englewood Cliffs, New Jersey)

Received 22 August 2013; accepted 27 February 2014

A limited vegetation survey of Cocoparra National Park and Cocoparra Nature Reserve

Eric Whiting

6 Cypress Street, Leeton NSW 2705

Abstract
A vegetation survey of the Cocoparra National Park and Cocoparra Nature Reserve completed in 1992-96 was partially repeated during 2004 and 2005 with 26 of the original sites being re-surveyed. Cryptogams were collected in the 2004-05 surveys and some soil analyses were completed. Sites surveyed covered 14 of the 16 vegetation units in the area. Two hundred and eight vascular plants were recorded and included 43 introduced species. These numbers compared well with those of the earlier surveys; 41 species recorded in the 2004-05 survey were not recorded in the earlier survey and 48 species recorded in the 1992-96 survey were not found in the later survey. Twenty-three mosses, 13 liverworts and hornworts and 47 lichens were recorded in the 2004-05 survey. (*The Victorian Naturalist* **131** (5) 2014, 162-176)

Keywords
Cocoparra Ranges, vegetation survey, bryophytes, lichens

Introduction

The Cocoparra Ranges are part of a series of low ranges and rocky sandstone scarp ridges that lie along the eastern boundary of the south-western alluvial plains of New South Wales (Fig. 1). These outcrops are separated from each other and from the western foothills of the Dividing Range by alluvial valleys. Being less accessible and on poorer skeletal soils, they have retained a covering of natural vegetation in a landscape substantially modified by agricultural use.

Most of the Cocoparra Ranges between Griffith and Rankins Springs was declared as a Nature Reserve (CNR) in 1963, in the northern half, and as a National Park (CNP) in 1969, in